

XLVI.—On the *Animal of Kellia rubra*.

By W. CLARK, Esq.

*To the Editors of the Annals of Natural History.*

GENTLEMEN,

Norfolk Crescent, Bath, May 5, 1849.

I BEG you to allow me the insertion of a few observations, in reply to Mr. Alder's last paper on *Kellia rubra* in the May number of the 'Annals.'

That gentleman has stated the result of his re-examination of the animal of *Kellia rubra* with great candour, observing that "in all cases" I have described "the parts very correctly." I feel pleasure in the corroboration of my examination of this very minute bivalve by so competent an observer, though we differ as to their uses. But however far apart our opinions may be, we will not forget in our disputations the prayer of the nymph Arethusa,—

"Doris amara suam non intermisceat undam."

I do not think it will be difficult to show that the anterior tube-like fold of the mantle of *Kellia rubra* is not a special branchial organ, according to Mr. Alder's views, and which he still retains.

It must be borne in mind that the mantle of *Kellia rubra* is open from the posterior branchial slit to its anterior termination. The open fold in question is merely a prolongation of that membrane; and when the animal opens its valves, it must receive, like the *Maetra* and *Veneres*, or any other bivalve with an open mantle, the currents of sea-water; and in closing them, a great part thereof, after bathing the branchiæ, is ejected from the aperture of *ingress*, and only a portion of it passes out by the posterior orifices.

These remarks will show that I did not use the words "branchial and anal, as applied to these apertures, in a literal and restricted sense." I am not aware I have said anything to warrant this inference. Mr. Alder has misunderstood me. I only stated that the posterior branchial slit in *Kellia rubra* is both a receiver and expeller of water; and this view I firmly adhere to. I never intended to state it was the only one, when the contrary fact is so evident in *Kellia rubra*.

Mr. Alder observes, that, agreeably to the "known œconomy of the bivalves, the inhalant is always kept distinct from the exhalant current, and admitted by a separate aperture from that by which the latter is expelled." This position is, I think, incorrect; as in those bivalves with open mantles the currents of water enter by the great pedal orifice or *rima magna* of the mantle, to aërate the branchiæ, and the greater part of the im-

pure fluid is expelled by the aperture of *ingress*, a small portion, as before stated, passing out by the posterior siphonal apparatus. In this case the apertures of *ingress* and *egress* are not "kept distinct."

In those mollusca with nearly closed mantles only a small portion of fluid can enter by the restricted pedal orifices; the far greater part must be inhaled by the posterior siphons, and is often expelled simultaneously at both orifices, as I have observed in *Pholadidea papyracea*, the most closed of all the bivalves; and whether the water be received through the anal or branchial tube, or both, the fact of the simultaneous expulsion of the fluid in almost equal streams proves that the known branchial œconomy of the bivalves does not require the apertures of inhalation and exhalation "to be kept distinct," as it is clear that water is expelled by one at least of the tubes of *ingress*.

The doctrine of the known œconomy of the bivalves, requiring the apertures of *ingress* and *egress* to be kept distinct, cannot, I think, be admitted; it has not been verified by competent authority. I do not believe in it, as it is disproved by indisputable facts.

I have little doubt that the water required for buccal and branchial uses, in the mollusca with closed mantles, is received through both the posterior apertures, anal and branchial as they are called; and probably at their bases there is an internal communication, thus allowing the water from both to pass into the great cavity of the branchiæ, to bathe them, and for sustentation of the animal; and after these functions are fulfilled, it is in like manner expelled from both orifices, and often simultaneously, as may be seen in any of the *Pholades*, *Lutrariæ*, or *Myæ*.

The water, I believe, never makes a circuit, or enters the legitimate anal tube, or issues therefrom, and which, to prevent confusion, ought to be denominated the rectum, or that portion of the viscera proceeding from the stomach to its termination at the posterior end of the body, where it empties itself into a conduit termed the anal tube. The legitimate anal cylinder, or rectum, is only for the discharge of the rejectamenta of the aliment entering the buccal orifice, and from thence passing to the stomach; for if the water entered this duct, either posteally or anteally, in the one case it would force back the fæces into the stomach, and in the other none would ever be found in the rectum; but the scalpel shows it is always filled from its point of junction with the stomach to its terminus with a cylindrical compact mass of fæcal matters, which, as the animal requires, is discharged by minute portions into the anal conduit; the water therefore for the branchiæ and sustentation must pass into the great branchial cavity, and issue therefrom by both the ducts at

which it entered, which is effected by the internal communication before mentioned between the two at their bases, the stream flowing smoothly out of the branchial one, and from the anal conduit, more or less irregularly as the animal opens or closes the hyaline valve, usually, if not always, found at its terminus.

A careful investigation of cause and effect, in these mollusca so difficult of examination, often produces a more satisfactory elucidation of facts than even the demonstrations resulting from the scalpel, which are often deceptive, erroneous and conflicting.

For these reasons the doctrine of the apertures of inhalation and exhalation being "kept distinct," or, in other words, that when the water is received by one duct it is discharged by another, is, I think, untenable.

Mr. Alder says, he saw, under the power of the microscope, a continuous current of water flowing into the anterior tube of *Kellia rubra*; all must admit this fact: as the fold is part of the open mantle, no microscope is here required, as in every open-mantled bivalve of adequate size this action is instantly made apparent by a common lens, and is the invariable result of the animal opening its valves; but that the most accomplished observer by the microscope can, with any certainty, detect in so minute a branchial slit as that of *Kellia rubra*, the entrance or egress of branchial currents, is to me a matter of the gravest difficulty, which I can only get over, not by doubting the perfect integrity of Mr. Alder's statement, but by supposing he may possibly be in error, and has been misled by the aberration and well-known great deceptions involved in the use of high microscopic powers.

But, for argument, we will assume that the posterior branchial slit, as Mr. Alder states, showed no signs of an ingress current. The contrary fact is, I think, proved by the contraction and dilatation of the slit; which action Mr. Alder admits, but says that it has "no power to produce the internal circulation, but merely to regulate the discharge." Surely the more reasonable assumption is, that the periodic opening and closing of the aperture is for the ingress and egress of part of the water for branchial uses; especially as I have shown that the analogous tubes of the close-mantled mollusca,—the anal one having, I believe, always at its terminus a hyaline contractile and expansive valve, which appendage the branchial one is sometimes provided with,—must of necessity receive and discharge the fluid necessary for the branchial œconomy.

As another, and the last proof I shall adduce, that the branchial slit, or aperture, in *Kellia rubra*, is not only for egress, agreeably to Mr. Alder's opinion, but is also one of ingress, according to mine, may be thus shown. Suppose *Kellia rubra*,

instead of being an open-mantled animal, is one of the closed mollusca,—where, in this case, is the entrance for the branchial currents? The only answer that can be given is, at the *posterior branchial slit*, and the discharge of the water must be at the *same aperture*. In this bivalve the fæces are, as I have repeatedly seen, discharged from the rectum in minute pellets into the *branchial slit*, which in this animal undoubtedly performs three functions, those of ingress and egress of branchial currents, and a conduit for the fæces.

It may be asked, why has nature departed from her usual branchial scheme only in *Kellia rubra* and *K. suborbicularis*? We will now examine into the "*cui bono*" of this fold of the mantle, considered as a branchial appendage. It is well known that nature never acts by way of surplusage; and having given *Kellia rubra* an open mantle by which the currents can enter, as in other analogous open bivalves, we must conclude she has not departed from her usual scheme, and that this fold is not a special branchial organ, but is intended to fulfill other functions.

I will mention what perhaps may be considered a conclusive proof that the tube-like fold of the mantle cannot be intended for the ingress of branchial currents, which is, that the animal very often thrusts its foot into the fold, and by the withdrawal of which it is opened and the edges separated. How then can a fold, whose form by this action is continually changing, and is subject to momentary interruption, be the conduit of regular, delicate, and uninterrupted branchial currents?

May we not infer from this constant alliance of the foot with the fold, that there is a more intimate functional connexion between them, perhaps of a locomotive nature?

I will now very shortly state the grounds of my conjecture, that the fold in question is to aid the animal in locomotion.

The habitat of this singular creature is at a far greater elevation in the littoral zone than any other bivalve, and nearly as far removed from the level of the water as the *Littorina petraea*, which is at no time completely submerged in the sea. The *Kellia rubra* on the Devon coast near Exmouth is generally imbedded in the *Lichina pygmæa*, which grows in the cavities of rocks of such considerable elevation and so near the land, that thousands of these animals pass their entire existence without perhaps ever being completely in a condition to receive branchial currents of sea-water; even the spray rarely reaches them except in gales of wind. It appears then that the tides washing the bases of their rocky habitat, combined with the saline mixture of atmospheric particles, supply a sufficient humidity for the growth of the *Lichina pygmæa* and the sustentation and welfare of the bivalve

colonies. These are startling facts, and go far to disprove Mr. Alder's doctrine, that the tube-like fold of the mantle is for the entry and regulation of branchial currents, which, even if they occasionally occur from spring tides and other causes, can only be in action for a very short time during the twenty-four hours. But I believe that in certain localities these creatures are not immersed in the sea-water for months together during the calms of summer. Many individuals of course inhabit lower levels, and will be more or less submerged.

*Kellia rubra*, then, may almost be considered a terrestrial bivalve. When it detaches itself from its hyaline delicate filamentary byssus, as it frequently does, to change place, food, and remove into more humid quarters, it is unable by its long slender foot to drag itself over the interstices of the fuci and the asperities or other matters in which it may happen to be settled without the aid of an additional power, which I am inclined to think is furnished by the extended fold of the mantle; and this supposition appears to receive strong support by the isochronal action of the foot and fold.

I am, Gentlemen, your most obedient servant,

WILLIAM CLARK.

XLVII.—*An Account of a Specimen of the Vaagmaer, or Vogmarus Islandicus (Trachypterus Bogmarus of Cuvier and Valenciennes), thrown ashore in the Firth of Forth.* By JOHN REID, M.D., Professor of Anatomy and Medicine in the University of St. Andrews.

[With a Plate.]

THIS fish was sent me on the 7th of April 1848 by Dr. John Berwick of Elie, near which place it was cast ashore dead. It was perfectly fresh when I received it; but the dorsal and caudal fins were damaged, and the ventral fins were entirely wanting—a condition, which, from the brittleness of these parts, is generally found in the adults of this genus of fishes\*. Its characters showed distinctly that it belonged to the family Tænioides and genus *Trachypterus* of Cuvier and Valenciennes, and on comparing these with the descriptions of the species of *Trachypterus* given in the work of Cuvier and Valenciennes, and that of the *Trachypterus vogmarus* or *bogmarus* by Professor John Reinhardt of Copenhagen, contained in the Supplement to the 1st edition,

\* Histoire naturelle des Poissons, par Cuvier et Valenciennes, tome x. pp. 314–15, and pp. 325–26. Paris, 1835.